



PATAGONIAN SCALLOP FISHERY (VIEIRA PATAGONICA)

Annual Surveillance Visit Final Report Required by the Marine Stewardship Council

2007-2008

Report N° 2

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Lic. M. Sánchez De Bock, Organización Internacional Agropecuaria, Secretary.

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Title:

**MSC Surveillance Visit 2008
REPORT for PATAGONIAN SCALLOP FISHERY**

Preface

The information, opinions, and conclusions made in this report are the sole responsibility of Organización Internacional Agropecuaria. Advice was sought and provided by Dr. E.M. Morsan, Institute of Fisheries and Marine Biology "Alte. Storni" and Dr. H.J. Cranfield, Seabed Processes Consultancy.

Certificate Number: 010106/11

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Date of Summary: October 2008

2. General information**Name and contact information for the certified fishery:****Client contact:**

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General background about the fishery

The Patagonian Scallop (*Vieira Patagonica*) Fishery was certified in November 2006 by the Organización Internacional Agropecuaria (OIA) following the Principles and Criteria of the Marine Stewardship Council (MSC). The MSC requires that certified fisheries must undergo at least an annual surveillance inspection in order to ensure that the certification is in place and the fishery is fulfilling the conditional requirements imposed in the original certification. The fishery has completed its second period of fishing activity. At the end of the five year certification period, the requirements of the MSC are that the Fishery must complete a re-certification before the anniversary date of the original certification, in order to ensure the uninterrupted use of the certificate and the MSC logo. If the Fishery fails a surveillance audit or re-certification, the use of the Certificate and the MSC logo can be revoked by the MSC or simply lapse. Re-certification review is simultaneous with the fourth surveillance audit, in October 2010.

3. The certification/assessment process

Dates of the Surveillance Visit:

Monday 29 September- Thursday 2 October 1, 2008, Mar del Plata (see Appendix I)

Friday 3-Monday 6 October, 2008, Buenos Aires (see Appendix I)

Members of the Surveillance Team:

- Dr. R.P. Pottinger, OIA Team Leader.
- Dr. E.M. Morsan, Principle 1, Resource Biology and Ecology.
- Dr. H.J. Cranfield, Principle 2, Environment.
- Lic. M. Sánchez De Bock, OIA, Secretary.

Principle 3, Management of the Fishery, was considered by all Assessment Team members.

Assessment Process

This report represents the Second Annual Surveillance, after OIA had notified the client Glaciar Pesquera S.A. where and when the Annual Surveillance Visit would take place. All Stakeholders who had expressed interest and contributed to the Full Assessment and First Surveillance Audit, were directly contacted by e-mail and/or by telephone. As well the intention to conduct the Annual Surveillance Audit and the programme was posted on the MSC and OIA websites. A list of Stakeholders directly contacted is appended (Appendix II). Stakeholders opinion, including managers, scientists, industry and environmental NGO's was sought on the performance of the fishery in relation to any of the relevant conditions of the certification or other issues following the MSC's Principles and Criteria for Sustainable Fishing.

The Assessment Team chosen, had all been involved in the Full Assessment process. Specifically it concentrated on review of:

- 1) Potential or actual changes in management systems.
- 2) Changes or additions/deletions to regulations.
- 3) Changes in scientific personnel, management and industry in order to evaluate impact on the management of the fishery.
- 4) Changes in the scientific base of information, including stock assessment.

No significant issues which could affect the sustainability and conduct of the fishery that require further investigation were identified, so procedures to embody such events were not required in the Assessment process.

The Assessment Team audited compliance with, and progress and performance against certification conditions; documenting progress with justification for its judgment, following TAB Directive D-013, and MSC Fisheries Certification Methodology, version 6.

As all conditions accepted in the Client Action Plan are still in progress, no re-scoring of all relevant performance indicators and scoring guideposts relating to the Conditions set in the Final Full Assessment Report, was required.

The inspection by the Assessment Team (See Appendix I) involved:

- A. In Mar del Plata: **Glaciar Pesquera S.A.**, Mr. Eduardo Gonzalez Lemmi; **INIDEP** (National Institute of Fisheries Research and Development), including Lic. Oscar Lascano,

Director INIDEP and Dr. Otto Wohler, National Director for Fisheries Research; Lic. Mario Lasta, Chief Patagonian Scallop Research Group and his team; and Dra. Claudia Bremec, CONICET-INIDEP, Head, Benthic organism/Communities Research; the **National University of Mar del Plata** scientists involved in research on Patagonian Scallop, lead by Dr. Oscar Iribarne, including Dr. Marcelo Kittlein, simulation modelling scientist; **FVSA** (Argentina Wildlife Foundation), Lic. Guillermo Cañete; **Argentine Prefecture**, Prefect Rodolfo Cristello and Official Sergio Zini; **Wanchese Argentina S.A.**, Mr. Pedro Böhnsdalen and Captain Malcolm Daniels. Written comments were received and considered from **CeDePesca**, Eng. Ernesto Godelman; **CAIPA**, CPN Mariano Perez, comments received by telephone.

- B. In Buenos Aires: National Director of Fisheries Coordination and Deputy President of the **Federal Fishery Council**, Ing. Marcelo Santos.

The methodologies used have been previously outlined in the Assessment Process.

General context

This report is the Second Surveillance Audit of the Patagonian Scallop Fishery in Argentina.

Scope and history of assessment

The Assessment followed the MSC Certification Methodology (FCM) for Surveillance Report, version 6 and the TAB Directive, D-013.

The Fishery was certified as an MSC Sustainable Fishery in November 2006 and this Surveillance Audit is the second conducted on it.

Stakeholder consultation:

- **Cámara de la Industria Pesquera Argentina (CAIPA) - President, CPN Mariano Pérez**

Contact with Mr. Mariano Pérez was made on 19th September 2008. CAIPA is in agreement with the conduct of the fishery. As there were no other subjects of concern, CAIPA stated that there was no need to meet with the Assessment Team during the 2008 Surveillance Audit.

- **Argentine Coastguard**

Prefect Rodolfo Cristello and Official Sergio Zini (Argentine Coastguard) discussed the certification procedures for management of the Patagonian Scallop fishery. The officials were enthusiastic about the manner in which the fishery is conducted to ensure its sustainability. They indicated that the fishery complies with all regulations. The Coastguard is an active participant in the management regime.

- **Argentine Customs**

Argentine Customs raised no issues adverse to the conduct of the Patagonian Scallop fishery.

- **Wanchese Argentina S.A.** Captain Malcolm Daniels and Mr. Pedro Böhnsdalen (General Manager)

The Wanchese S.A. representatives discussed with the Assessment Team the fishing gear and methodology used by Wanchese S.A. vessels, *Mr. Big* and *Erin Bruce* to reduce by-catch, reduce benthic damage and to increase the proportion of commercial sized scallops. Wanchese S.A. are achieving this by use of: light doors (aluminium in preference to steel); smaller nets and control of the net bag. Damage to undersize scallops returned to the sea is reduced by a stern mounted A-frame which receives and stabilizes the movement on the landed net and use of a larger 5 ½ inch mesh size to allow escapement of undersized scallops. Escapement is also assisted by use of nylon material (more flexible and longer wearing) rather than polyester that retains more sediment (sand/mud) in the net. This saturates the gear resulting in retention of a higher proportion of juvenile scallops. The gear is rigged to reduce contact with the seafloor and at the same time stimulate upward movement of scallops. A higher proportion of commercial size scallops is taken and with the reduced by-catch in the net bag and its lesser contact with the seafloor, damage is minimized. As a consequence there could be lower by-catch of hydroids on which the majority of larvae settle. The company has video-recordings of the net during fishing. Because of the methods used there is lower by-catch whilst both sorting time and fuel consumption are lower. Wear and tear on gear is reduced. Quantitative investigation is required to adequately indicate such benefits.

They raised the possibility of a 2-3 month closure, when the muscle mass declines and results in a lower quality product (softer tissue and less flavour).

The subsequent increase in biomass quality and amount could be taken as larger sized individuals at a later date.

Wanchese S.A. suggested that in their experience the average size of scallops taken is declining, but evidence of this was not presented.

Mr. Pedro Böhnsdalen and Mr. Malcolm Daniels commented to the Assessment Team that Wanchese Argentina S.A. has established a policy of fishing with only one vessel at a time. They do not wish to carry a large stock in cool storage to prevent deterioration of the product and lower its value.

Assessment Team Comments: There are biological reasons for temporary closures as Patagonian scallop switches from somatic to gonad production from May to June when primary production and food supply cease (Lomovasky *et al*, 2007). This process results in a 20% reduction of callus mass. The callus becomes softer and of poorer quality and flavour. The lowered physiological state in this period may predispose scallops on the seafloor damaged by the fishing gear thereby increasing indirect fishing mortality.

- **National Institute of Fisheries Research and Development (INIDEP, Directorate)**

The Assessment Team had a valuable discussion with the Lic. Oscar Lascano who has recently been appointed as Director of the Institute and Dr. Otto Wohler, National Director of Research, who affirmed INIDEP's desire to achieve sustainably managed fisheries. Their comments have been incorporated within the body of the report.

- **Argentina Wildlife Foundation (FVSA), Lic. Guillermo Cañete**

Lic. Cañete expressed a need for more regular internal and external scientific and administrative/management peer review within the fishery. The Assessment Team is providing surveillance reviews annually between the Certification assessments. These are not peer reviews. Both the Consejo Federal Pesquero and INIDEP are continuously reviewing the needs of the fishery. The CFP posts Resolutions and Acts on the internet each week. The Assessment Team considered that peer review is a relevant topic at the Re-certification review.

FVSA consider that the Patagonian scallop fishery is well managed and sustainable. The fishery meets the Principles and Criteria of the Marine Stewardship Council for sustainability. FVSA is conducting a publicity campaign supporting sustainable fishing, and therefore agrees with the MSC Certification of the Scallop Fishery.

- **Centre for Defence of Fishing (CeDePesca), Eng. Ernesto Godelman.**

CeDePesca) provided written comments on sustainable fishing of Patagonian Scallop related to MSC Principles.

- 1) Status of the stock

CeDePesca considers that the stock is sustainable based on independent opinions and published information.

CeDePesca express concern that there was an intention to substitute On Board Observers with Inspectors.

Assessment Team Comment: The Assessment Team established (Ing. Marcelo Santos) that the priority of the CFP was to ensure presence of OBOs on all vessels, but when possible to include inspectors as well. Each official had a distinct function: 1) obtaining scientific samples and recording fishery related information, and 2) compliance with the law.

- 2) Environmental impact of the fishery

CeDePesca acknowledged the value of the studies conducted by Dr. Claudia Bremec and her colleagues, on fishery impacts on the benthos.

- 3) Adequate Management

CeDePesca supported the increased precautionary approach inherent in the fishery allocations decided between the companies and the 4 vessels working the fishery.

- **National Director of Fisheries Coordination and Deputy President of the Federal Fishery Council, Ing. Marcelo Santos.**

- Regulations have not been substantially changed from one year to another.
- Informal procedures were used to establish management measures. These measures have been reconsidered and consolidated into formal resolutions e.g. CFP Resolution 04/08.

- Each management unit must have a TAC established before commercial fishing is allowed to commence.
- Surveys were conducted during 2008 to estimate the 2009 TACs. Strikes of crew on INIDEP research vessels resulted, in INIDEP being unable to conduct their annual surveys. CFP required that commercial vessels conducted the annual survey programme.
- The CFP has strengthened its precautionary approach by retaining 22% of the potential allowable catch in reserve (See APPENDIX III, CFP Resolution 14/08).
- The CFP reported that there has been no major recruitment this year, continuing the trend from 2002.

Assessment Team Comment: The INIDEP survey vessels have been unavailable until October 2008. The CFP and INIDEP utilized the fleet to conduct the surveys to establish the annual TACs. There is advantage in such interaction as it improves transparency and technology transfer within the fishery providing positive interaction between the Management Authority and the fishing company personnel.

This was advantageous as it provided one on one contact between scientists and fishing crews. Only one survey report has been provided utilizing a commercial vessel to survey management unit 10. Commercial nets were used. The client reported in correspondence that survey of all the management units has been completed by the commercial fleet. The reports on these surveys have still to be released.

At present the term recruitment is loosely used. It is used to refer to both settlement events (that lead to recruitment) and recruitment itself. Each term should be clearly defined when used.

The Assessment Team looked for some evidence of recruitment failure by constructing a simple model to describe the biomass trajectory of a hypothetical cohort using growth parameters (Tango B bed $k=0.34$, $L_{\infty} 64.01$, $t_0 = -0.09$, Lomovasky 2007) and the natural mortality rate ($M= 0.38 \text{ year}^{-1}$, Milessi *et al* research in progress). The model predicts maximum biomass of a scallop cohort at approximately 3.5 years (Figure 1). In spite of no major settlement events since 2002, the biomass estimated by surveys has not declined. This appears to indicate that recruitment has been regular. Indeed, recruitment exists but the scientific team has not observed any “major” recruitment event such as 1999-2000 and 2000-2001.

The CFP is monitoring fishing within the management areas electronically. When the catch exceeds 70%, a precautionary approach is applied to prevent overfishing of the TAC.

Catch is tracked electronically with colour markers. Between 70 and 90% green, from 90 to 99.9% yellow. When catch exceeds 100% red. Vessels are ordered to cease fishing before catches reach 100%. Special attention is given to monitoring small beds as a daily catch is more likely to surpass the established TAC.

When fishing straddles the boundary between two management units, the CFP proportionally allocates catch by analyzing vessel tracks.

The CFP have established an IQ (individual quota system) for each vessel and each management unit. TAC is 40% of the lower confidence interval of the total biomass. CFP allocates only 78% of this TAC to the commercial vessels (the CMP, Argentine term for Captura Máxima Permissible).

Methodologies

The Assessment followed the MSC Certification Methodology (FCM), version 6 and the TAB Directive, D-013.

4. Results, conclusions and recommendations

General discussion of findings and statement confirming the status of the Certification

Historical fishery data is presented in the following table. The information has been sourced from INIDEP Technical Report (Campodonico *et al.*, 2008).

	Years										
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total biomass estimates	287.345	-	474.839	-	314.830	386.487	304.993	275.646	374.369	441.325	-
Commercial scallop biomass estimates	148.208	-	277.444	-	157.708	124.058	97.584	145.777	210.300	309.086	-
TACs	-	34.000	51.220	32.521 3 (Oct.	34.234	16.045	34.357 4 (Nov.	43.218	49.124	54.910	31.926
Vessels (n)	3	3	3	4)	4	4	3)	3	4	4	
Trips (n)	31	36	33	33	38	37	34	28	54	37	
On Board Observers (%)	22	16,7	36,6	42,4	63,1	59,9	67,8	100	100	100	
Muscle landings (t)	3.417	5.012	5.112	5.546	6.325	6.018	5.890	5.535	11.256	7.522	
Whole scallop catches (t)	28.441	42.700	36.513	38.961	50.967	42.969	42.065	39.522	80.400	53.726	
Days on trip (n y % annual)	794		891	850	1.279	1.198	1.138		1.157		
	(72)	938 (85)	(81)	(73)	(87)	(82)	(78)	835 (76)	(79)	852 (69)	
Days fishing (n y % annual)	652		775	724	1.075				912		
	(59)	783 (71)	(71)	(62)	(73)	968 (66)	901 (62)	652 (59)	(62)	660 (53)	
Nets (n)	46.704	63.787	64.392	64.056	97.292	96.256	95.049	66.873	85.591	68.407	
Muscle yield (%)	12,72	11,74	14,55	17,79	14,05	11,49	12,24	12,66	14,37	14,5	
Average trawling time (min)	16,36	17,34	15,51	15,37	16,69	13,89	12,61	12,57	11,46	11,6	

See Figure 3 and 4 for graphics on historical data:

Figure 3. Annual yield of scallop muscle (t), commercial Patagonian scallop caught (t) and the fleet-year trawls (lances), from 1995-2007.

Figure 4. Annual commercial estimated biomass (t), and landings (using conversion factor 7.14) of Patagonian scallop, from 1998-2008.

- During 2007 *Mr. Big* was replaced by *Erin Bruce*. *Mr. Big* ceased operation in mid-February and the replacement vessel *Erin Bruce* made its first trip in July, 2007.
- During 2007, the On Board Observer Program covered 100% of the trips (37).

During 2007, 7,522 t of muscle was landed. This was lower than in 2006 (11,256 t), the largest in the history of the fishery. The decrease can be partly explained by lower fishing effort.

- In 2007 the number of fishing dates decreased in comparison to 2006. This was caused by closure of the fishery by the CFP (Act No. 3/07), and union problems.
- Muscle production in 2007 increased slightly compared to 2006. This is possibly due to improved on-board processing and efficiency.
- The amount of muscle landed in 2007 decreased relative to 2006. As well indicators of fishing effort (days at sea, number of tows, etc.) also declined. There were no significant differences in production of muscle per day between 2006 and 2007.

Status of the Conditions and Recommendations.

All the conditions apply to Principle 1 and recommendations apply to all three Principles.

A. Principle 1. The resource.

▪ Condition 1

Performance Indicator 1.1.1.3

The population dynamics of the species (including age at maturity, natural mortality, growth, and fecundity) are understood.

Required Action: Within a maximum of 4 years, starting from the certification of the fishery it will be necessary to study the variability of the natural mortality rate for each bed, within each management unit.

Comment on Certification: The estimation of natural mortality is the most difficult task in marine resources studies, and any approach is imbued with uncertainty. But this parameter defines population dynamics and the harvesting strategy. An estimate of mortality has been made of the Patagonian scallop derived from an integrated model for the Reclutas bed (Valero, 2002), in addition to a study done by Lasta *et al.* (2001). The Assessment Team recommends estimating mortality from size structure and age structure of populations within the protected areas of each bed so that by the end of the certification period there is a good understanding of the spatial variation of mortality. Improved estimates of these population parameters will provide more comprehensive data for simulation modelling of the fishery and its management.

Given the time span and the possibility of not having new cohorts to follow, it is important to realize that this comparison may not be fully possible or fully comparable within 4 years. Improved estimates of these population parameters will provide more comprehensive data for simulation modelling of the fishery and its management.

Statement of progress:

Milessi *et al.* (2008) have compared direct and indirect estimates of natural mortality for Patagonian scallops three beds (1.2: MdQ, 2: Reclutas and 3:San Blas) based on the growth parameters from the Von Bertalanffy Growth Equation.

To estimate M the scientific team conducted a Bayesian estimation procedure to separate estimates of M and q using prior information for M (Lasta *et al.* 2001; Valero 2002). They developed empirical estimates based on derived formulas commonly used in fisheries assessments and

quantified variation in the estimates through parametric bootstrapping. The modal value of direct estimates was 0.38 per year with 95% confidence intervals of 0.09 to 0.77 per year.

Estimates obtained with empirical methods were close to indirect estimates, in particular with a newly developed method for invertebrate species. This was very close in both point values and variability. The results suggest that the cheaper empirical estimates broadly used in many fisheries, could be employed here when no other estimates are available.

Lomovasky *et al.* (2007, 2008) are continuing to study ageing techniques and the validation of age analysing shell growth using stable oxygen and carbon isotope ratios. Four large beds were studied in combination with condition indexes and oceanographic data. The authors remarked that the growth lines coincide with pause in somatic growth during winter, when energy investment shifts from somatic growth to gonad development.

They described growth pattern along the latitudinal gradient of Patagonian scallop distribution. They found maximum size increase from north to south. This trend is opposite to that described by Ciocco *et al.* (2006) who recorded maximum size increasing from south to north.

The reproductive pattern has been analysed by Campodonico *et al.* (2008). The authors described the cycle, established sex-ratio as 1:1 and estimated the size of first sexual maturity (males: 36.63 mm; females: 36.31 mm).

Comment of Surveillance Visit:

The estimate of M , for these management units goes a long way to achieve the goal of this condition (development of estimates of natural mortality and its variability between each management unit).

Research on Condition 1 is considered to be well advanced and “ahead of target”.

▪ **Condition 2**

Performance Indicator 1.1.3

Appropriate reference levels have been developed for biomass and fishing mortality rate.

Performance Indicator 1.1.6.1

The overall population is at appropriate reference levels.

Required Action: In a maximum period of 1 year from the fishery certification, biological reference limits must be established based on the resource biology, regarding biomass and fishing mortality rate. Limit reference levels for each bed in each management unit (to be considered in management decisions) will need to be initiated within the current certification period.

Comment on Certification: The use of a rotational management strategy overcomes many of the difficulties associated with a traditional fishery. Rotational fishing strategies in scallop fisheries have been modelled (see Breen and Kendrick, 1997; Hart, 2003).

Statement of progress:

Hart (2003) proposes a formal rotational fishing strategy for the Canadian scallop (*Placopecten magellanicus*). There are many management measures for the Patagonian scallop which incorporate precautionary approaches (e.g. improved decisions on the reference limit, the requirement to estimate biomass and TAC before fishing of any management unit may commence, TAC is established as 40% of the lower confidence interval of the biomass estimate).

The fishermen have 60 days to fish each new bed discovered. This gives fishermen an incentive to look for new beds. Subsequently the management authority establishes the biomass and TAC for future exploitation.

A Doctoral thesis on the Patagonian scallop fishing process and the impact produced on the population has been presented. In this study Bogazzi (2008) used data and information from several sources: (i) historical data from commercial vessels and experimental fishing; (ii) positional, catch and effort data, and additional information of fleet activity between 1995 and 2005; (iii) interviews with fishermen; and (iv) information from surveys of abundance.

Comment of Surveillance Visit:

The target for this condition is to establish reference points for every management unit and manage the fishery so each population is at an appropriate level. This goal will be achieved in this fishery by developing a rotational fishing strategy.

Research on Condition 2 is considered to be “on target”.

▪ **Condition 3**

Performance Indicator 1.1.5.3

The assessment, including any assumptions, has been appropriately tested by simulation or other methods and considers uncertainties which are reflected in management advice.

Performance Indicator 1.1.5.4

The assessment evaluates the consequences of harvest strategies and evaluates the status of the fishery relevant to reference levels.

Performance Indicator 1.1.6.1

The overall population is at appropriate reference levels.

Required Action: Within a maximum period of 4 years from the fishery certification, the precision of the estimates in the stock evaluation must be improved, taking into account the uncertainty of the initial data and testing of the sensitivity of the results.

Development of the possible changes in exploitable biomass, relative to the catch strategy currently applied, under different fishing scenarios will need to be initiated within the current certification period.

Comment on Certification: Although biomass estimates are precise, the estimate of catch from landed meat weight by a single estimate of meat weight-green weight conversion coefficient is very imprecise and has no estimate of variability. Precision of catch estimation should be investigated and improved methodology developed. The consequence of the present harvest strategy can be evaluated from only 6 years catch data, so simulation studies must be initiated to evaluate their effects over long periods with different scenarios to test sensitivity to assumptions made and imprecision of parameter estimates.

Statement of progress:

Several Technical Reports informing the outcomes of the biomass surveys were provided to the Assessment Team, namely:- Survey Report N° 4 (2008), Technical Report N° 36 (2007), Survey

Report N° 16 (2007), Technical Report N° 36 (2007), Technical Report N° 20 (2008), Technical Report N° 30 (2007).

The primary settlement of scallop larvae on hydroids (Bremec *et al* 2008) has a potential to limit recruitment. Thus recruitment could be proportional to the density of hydroids rather than to the reproductive capacity of the scallop population. This may allow the development of a new concept in population reference points, e.g. a reference biomass level for hydroids in commercial by-catch or survey samples. NOTE. On board observers could develop a qualitative estimate of the abundance of hydroids in the biological samples.

Comment of Surveillance Visit:

Due to the foresight and planning of Lic. Mario Lasta and the Scallop Team and the excellence of the biomass survey recording system, INIDEP has developed a unique and exceptional data base for population analysis of both target and by-catch species.

In the previous reporting period, Kittlein (2007) developed a prototype model for simulating population dynamics for stock assessment and management. The research team reported that over the present year the model is being refined, incorporating new growth and mortality estimates. This model will be developed to test rotational fishing strategies in this fishery. The Assessment team would like to see this preliminary model tested within the next reporting period.

Research on Condition 3 is considered to be “on target”.

▪ **Condition 4**

Performance Indicator 1.3.1

There is adequate information on the population structure and reproductive capacity of the resource.

Performance Indicator 1.3.2

The age/sex/genetic structure of the resource is monitored to detect significant impairment of reproductive capacity.

Required Action: Within a maximum period of 1 year from the fishery certification, the relative fecundity per size or weight must be established for each bed, and within a maximum period of 2 years from the fishery certification, a study on the oceanographic variables involved in relation to recruitment must commence.

Additionally, within a maximum period of 3 years after the certification of the fishery correlation over time with the changes in size, age and sex structures of each bed must commence in order to evaluate the impact of the fishery on the reproductive capacity of the stock.

Comment of Certification: No relationship has yet been established between local stocks and recruitment in populations of *Z. patagonica*, and little relationship has been found between parental stock and recruitment in scallops in general. Hence “conventional wisdom” tends to dismiss the importance of a stock-recruitment relationship in scallops with most variation in recruitment being attributed to effects of environmental variation on larval mortality and settlement. Nevertheless, McGarvey *et al.* (1993), found egg production was correlated with recruitment in two Georges Bank populations of *Placopecten magellanicus* and this correlation was stronger and held more widely among other populations when egg production of older (larger) scallops alone was considered. They concluded that the two scallop populations may be reproductively self sustaining stocks. Furthermore, recent modelling of larval dispersal in the Caribbean concluded that marine

populations must rely on mechanisms enhancing self-recruitment rather than depend on distant 'source' populations (Cowen *et al.* 2002). There is sufficient doubt about the relationship between stock and recruitment in scallops to make investigation of fecundity of *Z. patagonica* a sensible precautionary approach to management of this new fishery.

The fecundity data will provide input to simulation models of the fishery and its management.

Statement of progress:

The Scallop team is continuing work on developing understanding of the age structure of populations for scallops from shell structure (Lomovasky *et al.*, 2008) and the reproductive potential of the stock will be evaluated using information of the age structure and the fecundity of the scallop. Samples have been taken to study the relative fecundity per size or weight within the shelf break front beds. Analysis will be conducted in the next period. Information on fecundity of the population is still to be completed and should be given a higher priority.

Age and sex ratio of the population is being monitored in the Biomass surveys and will be analyzed to investigate changes in size, age and sex structure of each management unit over time to evaluate the impact of the fishery on the reproductive capacity of the stock.

A second approach to understand the reproductive capacity of the resource is to determine the likelihood of larval retention and larval movement between management areas within current systems of the shelf break environment. Modelling studies at the Universidad Nacional del Sur (Dr. Elbio Palma, Bahía Blanca, Argentina) are investigating oceanographic fronts and other studies are investigating the relationship between genetic constitution of populations and oceanographic fronts.

Franco and Palma (2008) have studied the potential movement of larvae in the shelf break front by modelling particle tracking in the physical oceanographic environment. This will give a better understanding of the likely genetic flow between beds. Franco *et al.* (2008) have developed a better understanding of the complexity of the shelf break front (multiple layering of water holding larvae). This multiple layering will result in very complex distribution of larvae over the seafloor. The temperatures differences within the fronts have proved to be greater than previously documented and will drive much stronger currents than recorded. The researchers are testing hypotheses of the effects of such water movement on settlement of larvae. Particle movement studies are important in testing these hypotheses but are costly. Analysis of surface temperature derived from satellite imaging alone is insufficient for benthic systems. The study is considering the redistribution of plankton up to 60 km inshore of the shelf break and the return of plankton and larvae into this zone.

The potential genetics mixing between beds have two related lines of investigation:

- 1) INIDEP is investigating genetic differences by use of Inter Simple Sequence Repeats (ISSR).
- 2) Dalhousie University (Halifax, Canada; Dr. D. Ruzzante) to: 1) identify markers for population studies on the scallops, 2) determine variability of markers between scallop beds, 3) understand isolation between scallop beds. His study will continue until June 2010.

Trucco and Lasta (survey technical report 2008) provided the first step for identification of markers and this is expected to be completed in two and a half to three years. A paper will be published in the next three months. This will inform other genetic studies. There have been very few genetics

studies in fisheries worldwide. The research team expects that they will have a good understanding of the genetic differences between beds by 2009.

Annual sampling following the techniques will culminate in a definitive model in year 5.

Apart from studies on fecundity, research on Condition 4 is considered to be “on target”.

B. Principle 2. The environment.

See **Recommendations**. These are presented here as most of the recommendations made in the Certification Report, belong to this principle.

Performance Indicator 1.1.1.2

The life history of the species is understood.

Performance Indicator 1.1.1.6

Information on the relationship of recruitment to parental stock is understood.

Recommendation 1.

To continue with studies on the requirements for settlement and commence studies on morphology and larval development. To study the rate of settlement, for example by means of measurement of the prodisoconchas and the environmental factors that govern the recruitment of the species. These studies will contribute to knowledge on the factors affecting larval settlement and, therefore recruitment intensity, which is important for prediction of production from the different beds. It is difficult to firmly establish the stock-recruitment relationship for this species. There are a number of factors involved, but it is necessary to identify these. The uncertainty of reproductive success mediated by environmental variability may also make the relationship between fecundity and recruitment more difficult to unravel but other scientific investigations suggest it is likely to prove important. These data will provide input in simulation modelling of the fishery and its management.

Statement of progress:

The work outlined in the previous year has been amplified and published (Bremec *et al.*, 2008). Most spat settle on hydroids (*Symplectoscyphus subdichotomus*), smaller numbers settle on sponges and polychaete tubes encrusting adult scallops. Analysis of species on which spat could settle, show a cluster of species with variable abundance of hydroids (higher in samples with spat), scallops, and predators. This study included a site with numerous attached spat. This site had lower densities of potential predators and had hardly been fished in comparison with other sites close by. The availability of primary settlement surface should be monitored in biomass surveys and on board observers samples and areas with dense patches of hydroids should be protected from trawling.

The primary settlement of scallop larvae on hydroids (Bremec *et al.* 2008) has a potential to limit recruitment. Thus recruitment could be proportional to the density of hydroids rather than to the reproductive capacity of the scallop population. This may allow the development of a new concept in population reference points, e.g. a reference biomass level for hydroids in commercial by-catch or survey samples. NOTE. On board observers could develop a qualitative estimate of the abundance of hydroids in the biological samples.

Comment of Surveillance visit:

The results obtained by Dr. Bremec suggest an important new area of research related to the population dynamics of the species.

The data suggest the importance of maintaining stocks of hydroids in the benthic fauna which can be protected from trawling by: 1) modification of the fishing gear to reduce contact with the sea floor and minimizing benthic by-catch (see comments from Wanchese S.A. in this report), 2) temporary closure of areas with dense patches of hydroids, 3) use of reserve areas to allow hydroids to develop in the absence of fisheries, 4) increasing the number of management units, and following a rotational fishing strategy on them to allow regeneration between fishing episodes.

Performance Indicator 1.1.2.1

Fishery removals are recorded/estimated (including landings, discards and incidental mortality).

Recommendation 2.

Carry out estimations and keep registers of incidental mortality during the different fishing activities as a consequence of recapture and discard of juveniles or the process of cooking juveniles fixed on the shells of commercial size scallops that are processed.

This will permit understanding of the fishing activities which cause significant mortality of juveniles that currently are not taken into account for evaluation of the impact of fishing on the stock at population level, nor for the estimation of allowable catches. These data will provide input in simulation modelling of the fishery and its management.

Statement of progress:

Valero and Lasta (2008) re-analyzed the survival rate of scallops estimated from an experiment by Bremec *et al* (2004). The re-analysis suggested the experiment had not continued for enough time to identify protracted mortality. It also highlighted differences in length frequencies of the control and treatment groups of scallops used in the experiment.

Valero and Lasta (2008) concluded that “Given the poor selectivity of the current fishing gear in the Patagonian scallop fishery and the negative effects of onboard selection on survival of discarded scallops, additional research on improving gear performance and processing efficiency is needed. Evaluation of square mesh codends such as those used in the Queensland’s saucer scallop and prawn fisheries (Broadhurst *et al.*, 2006) could improve the poor selectivity of the current gear and reduce mortality associated with the current onboard selection process. Current management measures for the Patagonian scallop fishery include permanent reserves, a minimum size limit, and a quota based on a fraction of the commercial biomass. Given the significant negative effects of the sorting process on the survival of undersized discarded scallops and the uncertainty on the duration and magnitude of protracted discard-mortality, alternative management measures and strategies should be evaluated in the Patagonian scallop fishery”.

Comment of Surveillance visit:

The variance of the conclusions of the two papers suggests that this experimental analysis should be repeated with better matched control and treatment groups, and longer experimental periods (perhaps carried out in shallow inshore waters).

Performance Indicator 1.1.2.6

Selectivity is known for the fishery (including incidental catches).

Performance Indicator 3.2.2.1

The fishing gears, methods and practices suitable for harvest of the target species have been examined with regard to their adverse impacts on habitat (especially in critical or sensitive zones),

their rates of capture of non-target animals and incidental impacts on target animals. The gears with least impacts and non-target catches are used and/or prevented by other management measures.

Performance Indicator 3.2.7.2

The operations of the fishery are conducted so as to minimize (to the degree practical) the mortality of discarded non-target catch. Fishermen and others in the industry take reasonable measures, beyond the formal management requirements, to minimize such mortality.

Recommendation 3.

The selectivity of the fishing gear (otter net) could possibly be improved using large square mesh to evaluate whether the by-catch of other invertebrates, juvenile scallops and non living material could be reduced.

Statement of progress: Captain Malcolm Daniels (Wanchese S.A.) has considered the fishing gear relative to the needs of the fishery.

Comment of Surveillance visit: It was pleasing to learn of the development made by Wanchese S.A. to improve the fishing gear used (see Stakeholder consultation section and Recommendation 1).

Performance Indicator 1.1.5.1

There is a scientifically-rigorous stock assessment methodology that is relevant to the biology of the target species and the nature of the fishery. The assessment uses all available relevant data.

Recommendation 4.

Initiate studies on the application of analytical models and elaborate conceptual and quantitative models that permit demonstration that the management methods applied to the fishery are appropriate (without substantial changes in the biomass and capture), integrating survey evaluations with the commercial fleet data on an appropriate map. Periodically evaluate the F value stipulated. This recommendation aims to predict yields in different fishing scenarios in order to apply management actions which contribute to the sustainability of the fishery. The use of a rotational management strategy overcomes many of the difficulties associated with a traditional fishery. Rotational fishing strategies in scallop fisheries have been modelled (see Breen and Kendrick, 1997; Hart, 2003). Similarly, the use of predictive models for rotational fishing as it was applied to the *P. magellanicus* fishery (See Hart, 2003) should be investigated.

Statement of progress: The study of Milessi *et al.* (2008) has calculated natural mortality (M) and fishing mortality (F) over three beds and 63 boxes over a decade. These data will be used in developing a more rigorous fishery model to estimate fishing mortality and develop rotational fishing strategies.

Performance Indicator 1.3.2

The age/sex/genetic structure of the resource is monitored to detect significant impairment of reproductive capacity.

Recommendation 5.

Study the genetic structure for each bed with the objective to determine the source-sink relationship and its correlation with the fishing activity. This will allow application of protection measures or creation of no-take zones, with the aim to maintain the genetic diversity of the stock and improve the settlement of larvae in the different beds.

Statement of progress:

Preliminary results of Inter Simple Sequence Repeats based on the study of micro satellites, showed high numbers of polymorphic loci. Clear differences existed between beds at the extremes of distribution and the method shows promise for analyzing the intervening stocks (Trucco and Lasta, survey technical report 2008).

Comment of Surveillance visit: this recommendation partially overlaps with condition 4.

The Assessment Team recognizes the high quality of Dr. Inés Trucco pioneering research and the importance of it to the goal of managing the Patagonian scallop fishery sustainably. The Assessment Team feels that the research would benefit from increased funding to ensure publication.

Performance Indicator 2.1.1.2

The habitat requirements of the target species, in particular the settlement habitat of juveniles, are known.

Recommendation 6.

Initiate studies to establish if the primary settlement occurs on the shells of the adults or if the presence of juveniles is the result of secondary settlement from another substrate.

Although bushy bryozoa and hydroids have not been recorded in fishery-trawl or survey-dredge bycatch, many of the echinoid groups present in the bycatch feed on bryozoa in other areas hence bryozoa and hydroids may be more important in the benthos than their representation in the bycatch suggests. Fishing is likely to destroy emergent bushy bryozoa or hydroids more rapidly than other benthos (see Collie et al., 1997; 2000). If primary settlement of scallops is on such filamentous substrates in Argentina as it is elsewhere, then fishing by reducing this substrate will have an effect on recruitment. If primary settlement is on the shells of adult scallops alone, the removal of adult scallops by fishing will likewise affect recruitment and fishing mortality will operate equally on cohorts of small juveniles as well as adults.

If primary settlement is on filamentous substrates, fishing gear could be modified to reduce its impact on the seafloor and damage to filamentous benthos and help sustain recruitment. If primary settlement is on adult scallops recruitment will probably be best sustained by rotational fishing that maintains high adult populations locally.

Statement of progress: See Recommendation 1.

Comment of Surveillance visit: See Recommendation 1.

Performance Indicator 2.1.1.3

Information is available on the position and importance of the target species within the food web.

Recommendation 7.

Quantitatively study the ecological relations in the benthic community. Scallops dominate biomass and production in the benthos. Gut contents show they ingest mainly diatoms and some dinoflagellates. Investigation of gut contents of other suspension feeders could identify whether they are competing for the same resource and investigation of the isotope signal of carbon in scallops (adults and juveniles) and the other suspension feeders could show the proportion of benthic and plankton algal production and plankton.

These data can be modelled to develop an understanding of how present fishing is likely to indirectly alter benthic energy flow and dynamics and how management can minimise the effects on the food web and productivity.

Statement of progress: The hypothesis that changes in scallop density can influence the composition and structure of the food web continues to be investigated. Trophic relationships and their connection with frontal variability were researched by Mauna *et al.* (2008a, *in prep.*). They sampled 9 species of macro-invertebrates in two transects normal to the front. They analyzed C¹³, N¹⁵ and C/N ratio in two suspension feeders, one deposit feeder, five intermediate predators and one top predator. Initial analysis found changes up the food web as expected, as well as changes in scallop isotopic signature across the front.

Performance Indicator 2.1.1.5

There is information available on the recovery rate of the ecosystem from fishery related impacts.

Recommendation 8.

Annually tabulate the quantitative data from the by-catch collected for each bed, by the On Board Observer Programme and the research surveys, comparing these with the 1995 data base. Compare the quantitative by-catch data obtained from the trawls in fished areas with those obtained from trawls in non-fished zones within the same bed, which are collected in the annual research surveys.

The testing of these data will show whether benthic habitat regenerates in the absence of disturbance by fishing. Regeneration of benthic habitat on fishing-disturbed-seafloor is linked to increasing productivity of fisheries on this habitat (Cranfield *et al.*, 2001).

Such habitat regeneration is likely to follow a succession that is partly determined by distance from sources of propagules and partly by period without disturbance hence habitat recovery can be facilitated by rotational fishing (Cranfield *et al.*, 2004). If benthic habitat does recover here, analysis of the data will be useful in determining length of rotation cycle and sizes of areas and usefulness of MPA's in a rotational fishery management plan.

Statement of progress:

Schetjer *et al.* (in press), compared the composition, structure and biomass of the species assemblage in the fished area and the un-fished exclusion zone of the Reclutas management area (currently N° 2 management area) between 1998 and 2002 directly. The benthos of 71 samples from the fished zone and 23 from the un-fished exclusion zone were taken in the 2.5 m wide dredge with 10 mm mesh. No difference was found in species richness between areas. Scallop biomass was always higher within the exclusion zone. Echinoderms dominated biomass of bycatch, biomass of ophiuroids *Ophiactis asperula*, *Ophiacanta vivipara*, and asteroids *Cosmasterias lurida*, *Ctenodiscus australis* all decreased in the fished area but remained constant in the exclusion zone. The volutid gastropods *Ademelon ancilla*, and *Odontocymbiola magellanica* were undetectable in the exclusion area in 1998 but were found in moderate densities in 2002 but biomass of both species increased in the fished area. The biomass of tubes of the polychaetes *Chaetopterus variopedatus* and *Idanthyrus armatus* increased in the fished area but remained undetectable in the exclusion area. Multidimensional analysis showed that the stations within the exclusion area overlapping with the fished area in 1998, had become more widely separated by 2002. Curves of cumulative biomass and abundance of species (ABC curves) indicated undisturbed conditions in 1998 in the both the fished and exclusion areas. The curves in 2002 are consistent with the exclusion area not being disturbed and the fished area being moderately disturbed.

Historical by-catch data from the biomass surveys has been sorted and prepared for analysis to establish long term trends.

Comment of Surveillance visit:

The by-catch team are doing an excellent job and their effectiveness would be improved by provision of funding for scientists to present papers at workshops and conferences to increase their interaction with other specialists.

In order to understand the effects of fishing on the benthos and the target species more precise sampling tools are required. There is little information on the relationship between sediment and benthos. The sampling of benthos would be greatly improved by use of a grab to obtain qualitative data samples of benthos and sediment, and be monitored by video camera. The importance of this work gives a high priority for research vessel time to be made available.

Funding is required to take further scientific samples, purchase an independent video system to study seafloor habitat, and to allow collaboration with scientists from the Alfred Wegener Institute, Bremerhaven, Germany.

Performance Indicator 2.1.3.1

Information is available on the nature and extent of the non target species caught, or otherwise killed, by the fishery. This includes all non target species – invertebrates, fish, mammals, reptiles, birds etc.

Performance Indicator 2.1.3.2

Information is available on the extent and survivability of the discarded by-catch.

Performance Indicator 3.2.1.3

Catch levels are set to prevent significant capture of non-target species.

Performance Indicator 3.2.7.2

The operations of the fishery are conducted so as to minimize (to the degree practical) the mortality of discarded non-target catch. Fishermen and others in the industry take reasonable measures, beyond the formal management requirements, to minimize such mortality.

Recommendation 9.

Estimate the biomass of the non-target species for each systematic group and for each bed, each year, and evaluate the annual changes. Experimentally estimate the discard mortality for the principle species in the by-catch and consider it in the management system.

One aim of the fishery should be to reduce mortality and bycatch of non-target species so benthic habitat is less modified, trophic webs preserved and the productivity of the fishery maintained (see Cranfield *et al.*, 2001). Discarded bycatch is a major problem in fisheries world-wide but this figure could be reduced by 25 to 64% by modifying fishing gear (Hall and Mainprize 2005; Harrington *et al.*, 2005).

The components of bycatch, mechanisms of their capture and their subsequent mortality need to be measured so improvements can be measured in investigations of methods of reducing bycatch and bycatch mortality.

Comment of Surveillance visit: The Assessment Team recommend that the survivability of bycatch returned to the sea after sorting be tested experimentally.

Performance Indicator 2.1.4

Strategies have been developed and implemented within the fisheries management system to address and restrain any significant negative impacts of the fishery on the ecosystem.

Recommendation 10.

In addition to tabulation of the biomasses of by-catch for each group, each year (Performance Indicator 2.1.1.5, and 2.1.3.1), it is necessary to evaluate the usefulness of the fragile, long-lived species, which could suffer damage from the fishing gear and classification methods, as indicators of the impact of the fishery on the marine habitat.

The echinoids are long-lived species (Bremec and Echeverria 2005) and are frequently found in the by-catch of the fishery (Bremec *et al.*, 2003). Because of their fragility they are very sensitive to all fishing activity around the world.

By focussing study of the effects of fishing on especially fragile benthic species, deleterious changes in the benthic habitat can be more rapidly identified and improvements can be more rapidly identified and enumerated in investigations of methods of mitigating these effects.

Comment of Surveillance visit: The primary settlement of scallop larvae on hydroids (Bremec *et al* 2008) has a potential to limit recruitment. Thus recruitment could be proportional to the density of hydroids rather than to the reproductive capacity of the scallop population. This may allow the development of a new concept in population reference points, e.g. a reference biomass level for hydroids in commercial by-catch or survey samples. NOTE. On board observers could develop a qualitative estimate of the abundance of hydroids in the biological samples.

While the On board observer sampling protocol to record fragile taxa in the bycatch has been modified to record this bycatch, there is a need to evaluate changes in the biomass of these taxa.

Performance Indicator 2.1.5.2

The impacts on ecosystem structure and function from removal of target stock(s) are known.

Recommendation 11.

Study the consequence of removal of target species on ecosystem structure by modelling the energy flow. This recommendation is linked to recommendation 7.

Statement of progress: See recommendation 7.

Comment of Surveillance visit: See recommendation 7.

Performance Indicator 2.1.5.3

The impacts on ecosystem structure and function from removal of non-target stocks are known.

Recommendation 12.

Compare the benthic by-catch from reserve areas within each bed with those from fished areas and analyze systematic changes; and in particular, study how the recruitment of the species dependent on scallop shells for settlement have been affected.

Modelling energy flow through the benthic ecosystem will indicate the relative importance of each species and how the trophic web is likely to be affected by fishery removals of different species. These studies should be used in mitigation studies of the effects of gear modification and use of rotational fishing to let benthic habitat recover and maintain productivity of the fishery.

Statement of progress: This has been reported in by Schetjer *et al.* (in press). See recommendation 8.

Performance Indicator 2.1.5.4

Fishery impacts on habitat structure are known.

Recommendation 13.

Consider a more extensive use of video cameras to investigate the role of the scallops within the structure of the benthic habitat.

Remote underwater video allows direct observations of the effect of fishing on the benthic habitat in addition to the indirect studies analysing changes in bycatch. Observations of trawls in operation have shown that visibility on the seafloor allows capture of good images and use of a high resolution camera should enable specific identification of benthos. More extensive use of this system could allow direct comparison of fished seafloor, seafloor in reserve areas that has been fished and unfished reserve areas so giving direct evidence of fishery impacts on habitat structure.

These observations can be applied in modifying fishing gear to reduce its impact on the seafloor as well as directly testing the effect of rotational fishing on seafloor habitat.

Comment of Surveillance visit: A video camera is necessary to advance research in this recommendation. See recommendation 8.

Performance Indicator 3.1.7.1

Adequate funding is provided for management.

Performance Indicator 3.1.7.2

Adequate funding is provided for research.

Recommendation 14.

Study the need for increased budgets for management, control (authorities) and scientific research for regular presentation to the relevant authorities.

Communication of results in this fishery is good but one of the issues identified by the team was the lack of opportunity and lack of budget for scientists to brief management, control authorities and fishers in plain language the results and implications of their research. Facilitation of this communication will result in more cohesive management and greater understanding of its importance.

Comment of Surveillance visit: Glaciar Pesquera S.A. is funding research outside of INIDEP, such as in University of Mar del Plata. See Surveillance Report 2007.

Performance Indicator 3.2.5

The management system has considered no-take zones as a means to control exploitation.

Recommendation 15.

Analyze the usefulness of the current reproductive and experimental reserve areas, the necessity for relocation and/or establishment of new ones. No-take zones already exist in this fishery. Their effectiveness in excluding fishing, providing unmodified areas of seafloor for benthic comparisons with fished areas, and effectiveness in providing local sources of scallop larvae and propagules of other benthos, and the optimum size should be evaluated. These data can then be utilised in establishing new closed areas within the rotational fishing management regime to optimise production of the fishery.

Statement of progress:

Schetjer *et al.* (in press) have investigated the usefulness of no-take zones relative to fished areas by analyzing the effect of dredging on density of scallops and benthic organisms.

Performance Indicator 3.2.7.1

The operations of the fishery are conducted so as to minimize (to the degree practical) the capture of non-target animals, particularly those which cannot be released alive.

Recommendation 16.

The fishery undertake systematic trials measuring the effects of fishing operations on catch of scallops, size range of scallops and quantities and composition of bycatch and use this information to agree on long term gear modifications.

Statement of progress: See recommendation 3.

Comment of Surveillance visit: See recommendation 3.

C. Principle 3. The management.

The management system of the Argentine Patagonian Scallop Fishery (Vieira Patagonica, *Zygochlamys patagonica*) is evolving in response to the certification of this Fishery under the MSC Principles and Criteria. These changes have been positive and will improve the management, yield/performance and sustainability of the fishery in the long term.

The Surveillance Team has identified two main areas where changes have occurred since evaluation of the fishery.

1) Changes in the Research System.

Lic. Oscar Lascano has been appointed as National Director of INIDEP and Otto Wöhler continues to be the National Director of Research.

The financial support from Glaciar Pesquera S.A. has been formalized with University of Mar del Plata through an agreement. Funding is being directed to the University of Mar del Plata science team. Operational costs of the research are paid by Glaciar Pesquera S.A.

In spite the strike by crews of INIDEP research vessels, the research team has progressed with studies on the benthic environment.

The CFP, the National Authority and INIDEP, informed the Assessment Team that the Federal Government guarantees the financial support for the stock assessment for all Argentine fishery resources, including the Patagonian scallop fishery. This policy encourages industry to fund research in the Universities and other Institutes. The new management plan established by CFP Resolution N° 04/2008, however requires that every vessel in the Scallop Fishery will be available to undertake up to 20 days of investigation on the resource each year, or pay for the equivalent effort by INIDEP research vessels. This Resolution allowed the completion of the biomass survey in 2007-2008.

2) Changes in the Administrative System.

Implementation of a precautionary management approach has resulted in changes in the Administrative System of the Fishery.

The CFP has abolished Resolution N° 9/2006 and replaced it with Resolution CFP N° 4/2008. It maintains the management units established in 2007 (See Figure 2). The CFP Resolution N° 4/2008 also states that no fishing vessel can fish management units that do not have an established TAC. An estimate of the Biologically Acceptable Catch is required before fishing can commence. This will normally require a research survey, unless INIDEP can provide provisional approval based on known biological indicators. In such a case, the CFP will establish a TAC following a precautionary approach. (Art. 6 of Resolution CFP N° 4/2008).

Minimum size limit remains 55 mm height. When the size frequency of landings has more than 50% undersized scallops for two consecutive days, the vessel must move to another fishing area (Art. 14 of Resolution CFP N° 04/2008).

The biomass captured is calculated by transformation of scallop muscle weight using a conversion factor of 7.14. This conversion factor has remained unchanged. Catch data from 1995 to 2007 is presented on Figure 3.

The production of muscle and the management unit fished, must be reported daily to the National Direction of Fishing Coordination daily. It is communicated by e-mail. Vessels are also required to present a detailed capture report after each fishing trip.

The Satellite monitoring system of the fleet allows more accurate enumeration of the weight of scallops landed from each management unit. Catch data are compared with the final trip report of each vessel and electronic track records. When fishing straddles the boundary between two management units, the CFP proportionally allocates catch by analyzing the track of the vessel.

The National Direction of Fishing Coordination monitors fishing activities and capture in each management unit continuously. They advise both INIDEP and fishing vessels when 90% of the CMP has been caught. When the catch exceeds 70%, a precautionary approach is applied to prevent overfishing of the CMP.

Catch is tracked electronically with colour markers: between 70 and 90% green; from 90 to 99.9% yellow; and more than 100% red. Vessels are ordered to cease fishing before catches reach 100% in any management unit. Special attention is given to monitoring small beds as a daily catch is more likely to surpass the established CMP.

The authority notifies the Coastguard. The Coastguard informs all captains who must then stop fishing that unit. The Coastguard controls the closure and the fishing. The fishing companies also notify their captains.

Resolution CFP 04/2008 established the Scallop Commission. This commission includes 2 members of INIDEP, 2 members of the Management Authority and 1 representative from each of the fishing companies. Meetings of the Scallop commission provide a mechanism for fishing companies to present their ideas on management of the resource. The commission meets quarterly.

If a new bed is found, the vessel must inform to the National Direction of Fishing Coordination (SAGPyA) and INIDEP in writing within 5 days (Art. 11 of CFP Resolution 4/08). The vessels are allowed to fish in the newly discovered area for 60 consecutive days. The catch taken in such areas outside the management units are not included in the CMP.

The CFP have established an IQ (individual quota) for each vessel (39% to each company) and each management unit. (See APPENDIX III, CFP Resolution 14/08).

Overall recommendations.

Biomass surveys and TACs for 2008-2009. Discussion with INIDEP scientists indicated that the surveys conducted in 2008 using the vessels of Glaciar Pesquera S.A. and Wanchese S.A. utilized otter nets rather than dredges.

Only one of the reports prepared by INIDEP was received by the Assessment Team, although the vessels surveyed all management units. The reports are currently been prepared. The commercial fishing vessels are higher powered than the INIDEP vessels, and used Otter trawl nets. Both these factors will affect the estimates relative to those obtained by survey dredges for both targeted and by-catch species. Catches may differ even between vessels. The Assessment Team received no information about comparability with previous surveys.

In October 2008, the three INIDEP survey vessels held in port due to industrial dispute have now agreed to continue surveys as in the past.

The TACs appear to have been established by the commercial fleet survey related to historical data.

Recommendation 17.

Performance Indicator 3.4.2.4

The management system is subject to periodic external reviews.

Performance Indicator 3.4.2.5

The management system responds to the results of assessments and reviews.

Study the feasibility for and adoption of better external reviews of the management system and the incorporation of the results obtained in decision making. External reviews of the management system are important because they provide regular objective overviews of how the system is performing and readily identify areas in which performance can be improved. In one sense the MSC certification process has provided a major external review and the next review 3 years out will do the same again.

Comment of Surveillance visit: Both research and management show clear signs of response to Annual Surveillance Audits.

3) Glaciar Pesquera Corporate Social Responsibility.

The Glaciar Pesquera S.A. Department of Corporate Social Responsibility continues sponsoring the social programmes mentioned in the previous Surveillance Report:

- a. The Self-sufficient Food Production Programme
- b. The Ñandeyará Programme (Rescue of street-kids)
- c. The Habitat Improvement and Human Development Programme
- d. The “Grameen” Micro-credits Programme
- e. The Social Construction Store Programme

This fishing company does not process Patagonian Scallop in Argentina. It balances loss of added value production in the local economy by returning profits.

Issues identified

Interactions with the Client and the scientific teams involved in the research have been excellent, cordial and productive. The scientists have been responsive to all suggestions from the Assessment Team, and have progressed on target on these.

It would assist the Assessment Team if the Scientific Team investigating the fishery reported progress of the research in relation to the original conditions established by the OIA Assessment Team during Certification.

Notification of the problem with timely surveys to establish the biomass estimates and TACs has revealed the necessity for the Client to fully inform the Certifier of any change affecting the sustainability of the fishery immediately at the time of such event.

The Assessment Team propose in the future that the first day of the Surveillance Visit be devoted to consideration of all fishery related data (biomass estimates, TACS, capture records for each management unit in the fishery) in order to establish trends and to track how the fishery is responding to management. Such data will be required in advance of the visit by the Assessment Team members. This request recognizes the value of receiving all scientific information in advance this year. To improve consideration of material the Assessment Team proposes that a day be devoted to consideration of any question arising during the Surveillance Visit before retiring to write the report.

References.

Publications provided by the Client and the Scientist Team:

a. Scientific publications

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 - ACTA CFP N° 6/2008
 - ACTA CFP N° 8/2008
 - ACTA CFP N° 9/2008
 - ACTA CFP N° 13/2008
 - ACTA CFP N° 14/2008
 - ACTA CFP N° 15/2008
 - ACTA CFP N° 17/2008
 - ACTA CFP N° 19/2008
 - ACTA CFP N° 20/2008
 - ACTA CFP N° 23/2008
 - ACTA CFP N° 28/2008
 - ACTA CFP N° 35/2008
 - ACTA CFP N° 37/2007
 - ACTA CFP N° 45/2007

- **Appendix I.** Stakeholder Interview Schedule and Stakeholders consulted.

A. MAR DEL PLATA, 29 September- 2 October 2008

Monday 29 September

- Assembly of the Assessment Team in Mar del Plata
- 8.30 – 10.30 Team discussion
- 11.00 – 13.00 Mr. Eduardo González Lemmi, Glaciar Pesquera S.A. Client Company.
- 13.00 – 14.00 Lunch
- 14.00 – 16.00 Lic. Mario Lasta, INIDEP and Dr. Oscar Iribarne, Univ. de Mar del Plata
- 16.00 – 21.00 Team discussion

Tuesday 30 September

- 8.30 –10.30 Team discussion
- 11.00 – 13.00 Lic. Oscar Lascano, Director INIDEP. Dr. Otto Wohler, Science Director
- 13.00 – 14.00 Lic. Gabriel Blanco, INIDEP, On Board Observer Representative.
- 14.00 – 15.00 Dr. Claudia Bremec, INIDEP, Patagonian Scallop Programme Scientist.
- 15.00 – 16.00 Lunch
- 17.00 – 18.30 Mr. Pedro Böhnsdalen and Captain Malcolm Daniels, Wanchese Argentina S.A.
- 18.30 – 20.00 Dr. Marcelo Kittlein, Dr. Oscar Iribarne, Univ. of Mar del Plata and Lic. Mario Lasta, INIDEP.

Wednesday 1 October

- 9.00 – 12.00 Team discussion and Report writing
- 12.00 – 13.00 PM Miguel A Viola, Argentine Coastguard. Deputes: Prefect Rodolfo Cristello and Official Sergio Zini.
- 13.00 – 14.00 Lunch
- 15.00 – 18.30 Team discussion and Publications Review
- 18.30 – 20.00 Lic. Guillermo Cañete, FVSA.

Thursday 2 October

- 10.00 – 11.00 Glaciar Pesquera discussion meeting
- 12.30 Assessment Team returned to Buenos Aires.

B. BUENOS AIRES

Friday 3 October

- 08.30 – 10.00 hrs Team discussion.

- 11.00 – 14.00 Ing. Marcelo Santos, President Deputy of the Federal Fishery Council (CFP) and National Director of Fishery Coordination.
- 14.00 – 15.00 Lunch
- 16.00 – 21.00 Continue analysis of information and compilation of report, OIA Office.

Saturday 4 October

- 08.30 – 22.00 Report writing, OIA Office.

Sunday 5 October

- 09.00 – 21.00 Report preparation, OIA Office.

Monday 6 October

- 08.30 – 19.00 Report finalization, OIA Office.

Friday 11 October

- 09.00 – 18.00 Action Plan considerations, OIA Office.

Appendix II. List of Stakeholders contacted by e-mail in regard to the Patagonian Scallop Fishery 2nd Annual Surveillance Visit 2008.

- Glaciar Pesquera S.A.
- Wanchese Argentina S.A.
- SSPyA (Sub-Secretariat of Fisheries and Aquaculture)
- SAGPyA Secretariat of Agriculture, Livestock, Fisheries and Food
- FFC (Federal Fishery Council)
- PNA (Argentine Prefecture)
- INIDEP (National Institute of Fisheries Research and Development)
- CENPAT – National Patagonian Research Institute
- UNMDP (National University of Mar del Plata)
- CONICET - Technical and Scientific Federal Council
- FVSA (Argentina Wildlife Foundation)
- CEDEPESCA Center for Defense of Fishing
- CAIPA Fishing Industry Chamber
- Custom's Agent - "Shepherd and Associates"
- Secretariat of Environment and Sustainable Development
- Directorate of Fishing, Río Negro Province
- National Direction of Fishing Coordination

Appendix III. Client Action Plan 3rd Year.**ACTION PLAN 3rd YEAR**

BY GLACIAR PESQUERA S.A.

DATE: 20 October 08

GLACIAR PESQUERA S.A.: MR. EDUARDO GONZALEZ LEMMI

This action plan follows the conceptual considerations of the previous action plan (2007), with only minor modifications in order to ensure continuity with adjustment in relation to the Conditions set by the Assessment Team, according to the capability of the research resources available.

CONDITION 1

Required Action: Within a maximum of 4 years, starting from the certification of the fishery it will be necessary to study the variability of the natural mortality rate for each bed, within each management unit.

Year 1 (milestone 1)

Identify a) areas within each bed associated with the Continental Shelf Break Front, in which fishing effort is negligible and define the position of each for the particular year,

Status: Completed.

b) Identify beds, which have good records of Total Mortality (Z), Fishing mortality (F) in each of the above beds.

Status: Completed for three management units.

Year 2 – 3 (milestone 2)

a) Z, F and M will be estimated for each of the statistical sampling boxes (each approximately 67 km²) located in each bed (1.2 – previously known as MdQ bed, 2 - previously known as Reclutas, 3 - previously known as San Blas). These results will permit estimation of variability of these parameters within the spatial distribution of the resources in the three beds located at the northern sector of the fishery.

Status: Completed for three management units (1.2, 2 and 3). There are 9 important fishing areas within the shelf break front, management units 1.2, 2 and 3 and 5, 6, 7, 8, 9 and 10 (management unit 4 has no fishing significance). The first group constitutes a Northern continuous concentration, and the second group a Southern concentration, which have the same biological characteristics, suggesting that these two ecological zones are relevant to the calculation of Z, F and M rather the calculation of these for the administrative management units. Z, F and M for Management units in the Southern ecological zone: 5, 6, 7, 8, 9 and 10, will be established within a year.

b) Sex ratio in relation to intensity of fishing activity, will be estimated, which will also allow:

i) Growth studies to establish age-size relationship in each of the remaining beds along the shelf break front.

ii) Studies of relative fecundity per size or weight (samples have already been taken) within the shelf break ecological zones.

Status: This is in progress, and needs to incorporate data from the Southern ecological zone management units (5, 6, 7, 8, 9 and 10) in relation to fecundity and age-size relationship.

c) Documentation of all information obtained into a scientifically acceptable standard.

Status: In progress.

Year 4-5 (milestone 3) Prepare a paper on the variability of natural mortality rate for each bed located in the vicinity of the Continental Shelf Break Front and summarize all other relevant results.

Status: In progress.

CONDITION 2

Required Action: In a maximum period of 1 year from the fishery certification, biological reference limits must be established based on the resource biology, regarding biomass and fishing mortality rate. Limit reference levels for each bed in each management unit (to be considered in management decisions) will need to be initiated within the current certification period.

Year 1 and 2 (milestone 1) Calculate variation in the parameters for the following key biological reference points.

a. size/age at first maturity

Status: Completed for three management units.

b. age on each of the major Shelf Break Front Beds.

Status: Completed for three management units.

Year 2 – 3 (milestone 2) A preliminary model for the Rotational Fishing Strategy (RFS) will be further developed.

Status: Developed for two management units and currently being extended.

Year 4 - ∞ (milestone 3) Refinement of the Rotational Fishing Strategy model year by year. This is an “exceptional circumstance” as models by their nature need to be upgraded as new quantitative data became available. It is an ongoing process.

Status: In progress.

CONDITION 3

Required Action: Within a maximum period of 4 years from the fishery certification, the precision of the estimates in the stock evaluation must be improved, taking into account the uncertainty of the initial data and testing of the sensitivity of the results.

Development of the possible changes in exploitable biomass, relative to the catch strategy currently applied, under different fishing scenarios will need to be initiated within the current certification period.

- Year 2-3 (milestone 1) Within two years a Stock Evaluation Model will be developed using geostatistical techniques.
Status: On target for three management units.
- Year 4 (milestone 2) Analysis of changes that may occur in exploitable biomass under different fishing scenarios will be completed, but it will be an on-going revisable project.
Status: In progress.

CONDITION 4

Required Action: Within a maximum period of 1 year from the fishery certification, the relative fecundity per size or weight must be established for each bed, and within a maximum period of 2 years from the fishery certification, a study on the oceanographic variables involved in relation to recruitment must commence.

Additionally, within a maximum period of 3 years after the certification of the fishery correlation over time with the changes in size, age and sex structures of each bed must commence in order to evaluate the impact of the fishery on the reproductive capacity of the stock.

- Year 1 (milestone 1) Development of methodology without production of definitive results in order to prepare an Oceanographic Model which will estimate
a) larval drift.
Status: In progress.
- b) the potential of genetic mixing / isolation between management units.
Status: In progress. Two ecological zones are relevant to this analysis rather the calculation of these for all of the 14 administrative management units.
- Year 2-5 (milestone 2) Annual sampling following the techniques developed in milestone 1 above, culminating in a definitive model in year 5 from the certification of the fishery. Sample data tabulated ready for analysis and inclusion in the definitive model each year.
Status: In progress.
- Year 4- ∞ (milestone 3) Within a four year period an International – Argentine group will commence development of markers which will allow establishment of between beds variation in scallop genetics.
Status: In progress.

Signed: Mr. Eduardo Gonzalez Lemmi

Date: 20 October 08

Figure 1. Simple model of the biomass trajectory of a hypothetical cohort using growth parameters (Tango B bed $k=0.34$, $L_{\infty} 64.01$, $t_0=-0.09$, Lomovasky 2007) and the natural mortality rate ($M=0.38 \text{ year}^{-1}$, Milesi *et al* 2008, in prep.).

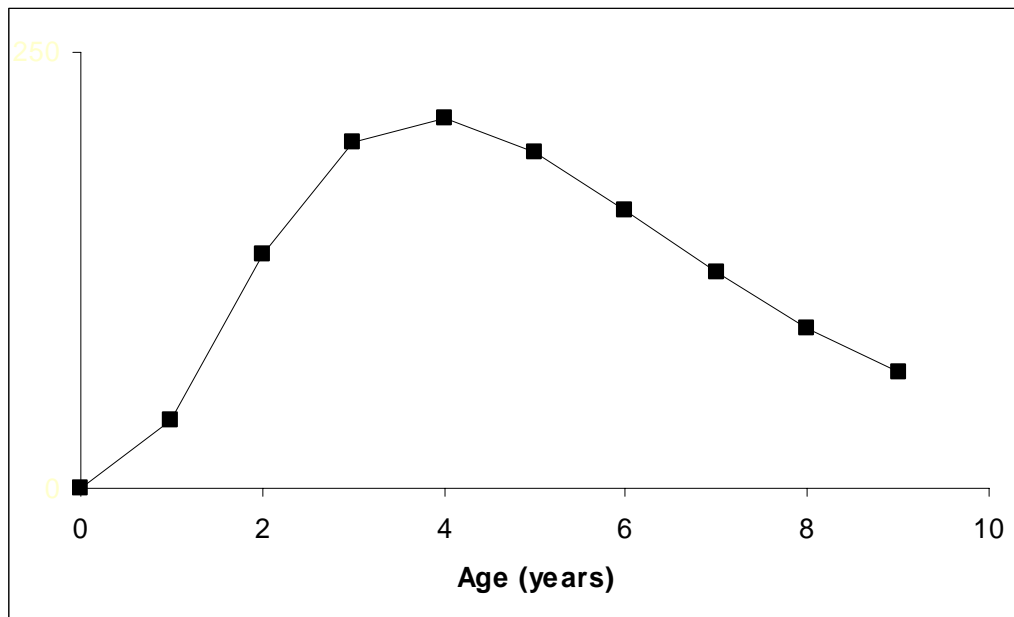


Figure 2. Spatial distribution and location of the new numbered fishing areas for the Patagonian scallop. (From Lomovsky, 2007)

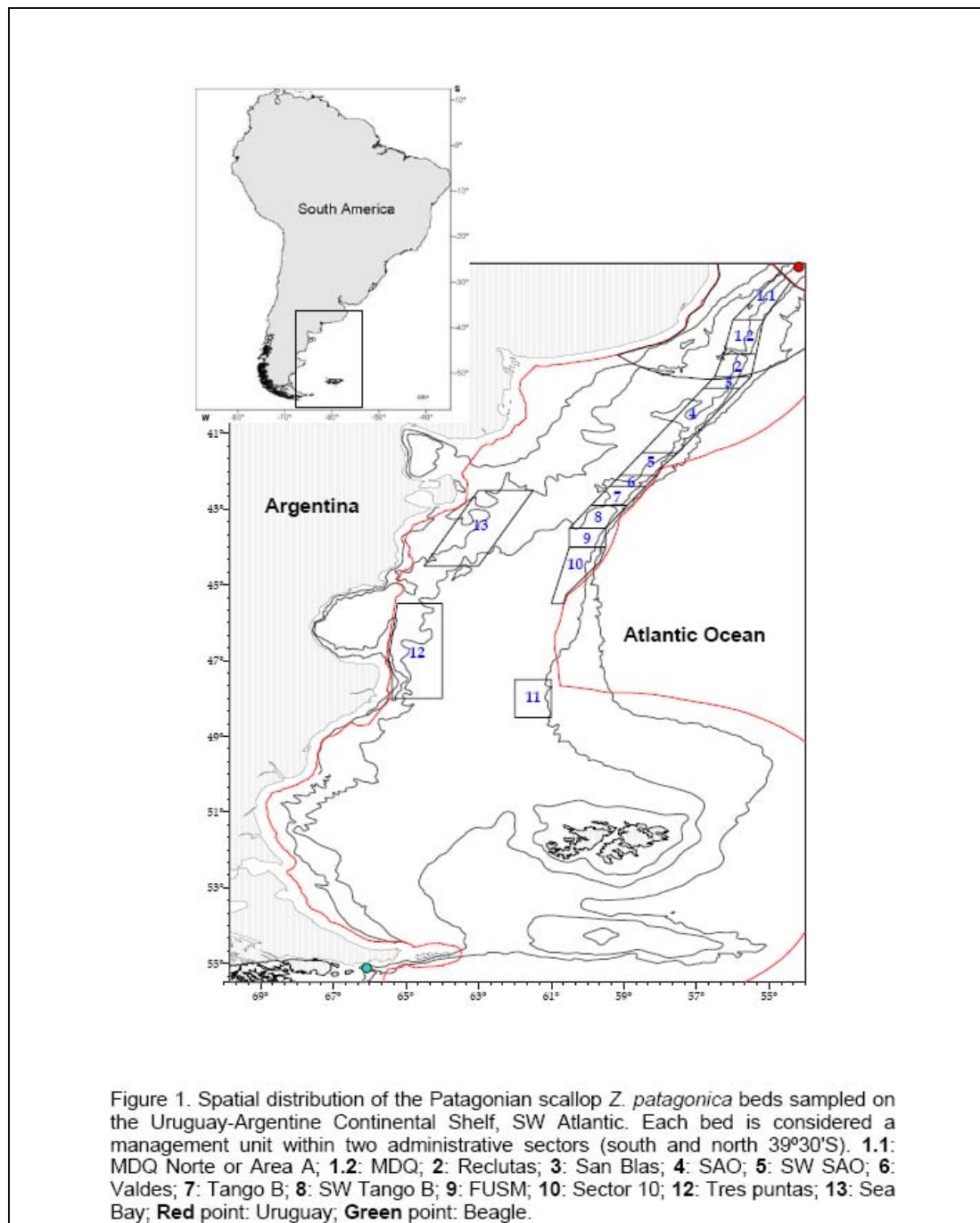


Figure 3. Annual yield of scallop muscle (t), commercial Patagonian scallop caught (t) and the fleet-year trawls (lances), from 1995-2007.

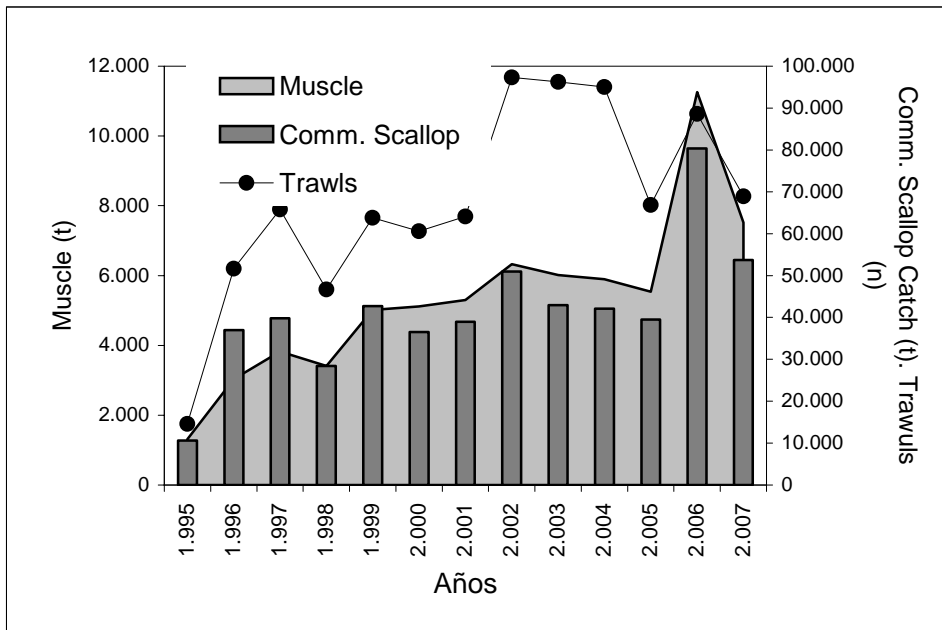
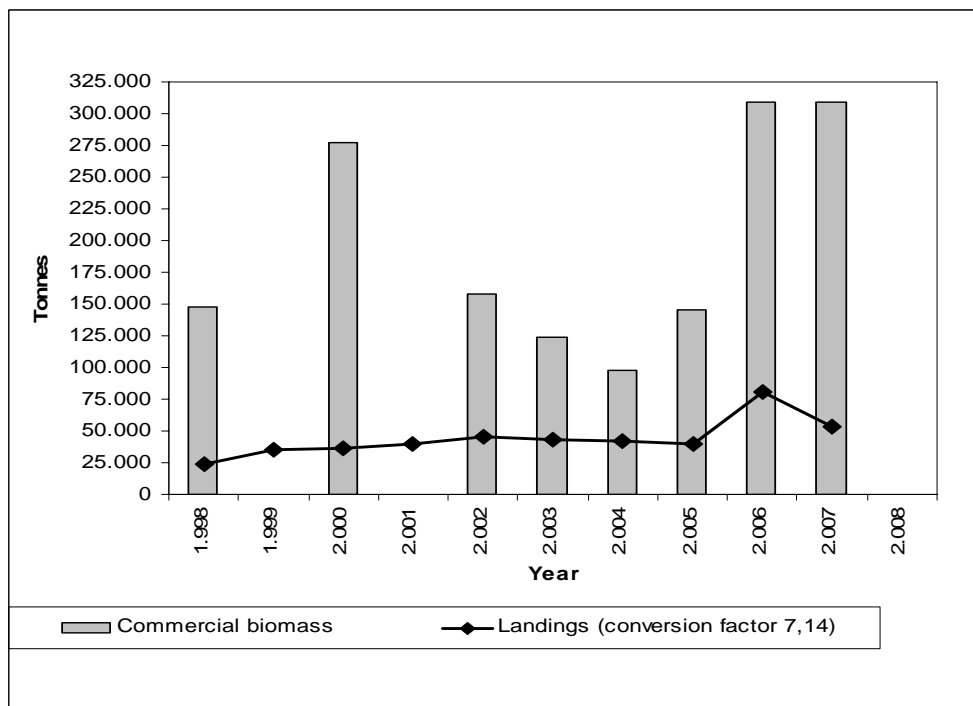


Figure 4. Annual commercial estimated biomass (t) and Landings (using conversion factor 7.14) of Patagonian scallop, from 1998-2008.



APPENDIX III. Resolution 14/08.

Source: Federal Fishing Council website: <http://www.cfp.gov.ar/resoluciones.htm>

BUENOS AIRES,

VISTO la Ley N° 24.922, el Decreto N° 748 de fecha 14 de julio de 1999, el Acta N° 48, de fecha 6 de diciembre de 2007, y el Acta N° 27, de fecha 14 de agosto de 2008, ambas del Registro del CONSEJO FEDERAL PESQUERO, y CONSIDERANDO:

Que de acuerdo a la política establecida por el CONSEJO FEDERAL PESQUERO en las Actas mencionadas en el visto, resulta necesario asignar Autorizaciones de Captura para la especie vieira patagónica (*Zygochlamys patagonica*), de conformidad con los criterios y condiciones que a continuación se explicitan.

Que por la Disposición N° 17 de fecha 17 de marzo de 1999 del Registro de la SUBSECRETARÍA DE PESCA y por Resolución N° 829 de fecha 7 de diciembre de 1999 del Registro de la SECRETARIA DE AGRICULTURA, GANADERIA, PESCA Y ALIMENTACIÓN, se estableció un Plan de Manejo de la especie vieira patagónica (*Zygochlamys patagonica*), el cual fue posteriormente derogado según Resolución N° 107 de fecha 16 de febrero de 2001 del Registro de la SECRETARIA DE AGRICULTURA, GANADERIA, PESCA Y ALIMENTACIÓN.

Que durante la vigencia de los planes de manejo establecidos por los actos administrativos señalados anteriormente, se realizó un trabajo de investigación y desarrollo juntamente con las empresas que operaron sobre el recurso, lo que significó un importante avance en el estudio de la especie, permitiendo a la vez una administración biológicamente sustentable.

Que a partir de la Resolución N° 4, de fecha 4 de agosto de 2005, del CONSEJO FEDERAL PESQUERO, se establecieron medidas de manejo para la especie en el marco de la Ley N° 24.922.

Que teniendo en cuenta el inicio y el desarrollo de la pesquería de la especie, no resulta factible priorizar los ítems contemplados en el artículo 27 de la Ley N° 24.922 en la forma prevista en el texto legal.

Que, a fin de proseguir con el desarrollo de la política de administración de los recursos pesqueros establecidas en las Actas N° 48, de fecha 6 de diciembre de 2007, y N° 27, de fecha 14 de agosto de 2008, ambas del Registro del CONSEJO FEDERAL PESQUERO, deben definirse los buques pesqueros que participan en la asignación de Autorizaciones de Captura en el marco de la presente resolución.

Que se estima conveniente incluir, en dicha categoría, a aquellos que registran historia de captura de vieira patagónica (*Zygochlamys patagonica*) mayor al DOS CON CINCO POR CIENTO (2,5 %), calculado sobre el total de las capturas de la especie en el período comprendido entre los años 2000 y 2007 –ambos inclusive-, de conformidad con los valores registrados por la Autoridad de Aplicación de la Ley N° 24.922, con las transferencias en su caso.

Que teniendo en cuenta la participación de esos buques en la pesquería, resulta adecuado definir un porcentaje de la Captura Máxima Permisible que guarde una proporción con dicha participación.

Que las asignaciones de Autorizaciones de Captura para la especie vieira patagónica (*Zygochlamys patagonica*) se establecen en porcentajes de la Captura Máxima Permisible por el plazo establecido en el Acta mencionada en el visto.

Que para determinar dichos porcentajes habrán de considerarse, por las particularidades del desarrollo de esta pesquería, la historia de captura del período comprendido entre los años 2000 y 2007 y las sanciones firmes en sede administrativa aplicadas a los buques, informadas por la Autoridad de Aplicación de la Ley N° 24.922.

Que habiéndose analizado y evaluado estos ítems resulta pertinente establecer su ponderación de la siguiente manera: historia de captura en el NOVENTA Y CINCO POR CIENTO (95%) y sanciones en el CINCO POR CIENTO (5%).

Que resulta necesario establecer el porcentaje máximo de concentración por empresa o grupo empresario al que se refiere el tercer párrafo del artículo 27 de la Ley N° 24.922, para el caso de esta especie.

Que atento al estado de la pesquería es conveniente establecer una Reserva de Administración sobre la Captura Máxima Permisible. A la Reserva de Administración se adicionarán los excedentes del porcentaje máximo de concentración y la detracción resultante de la aplicación del ítem sanciones.

Que debe preverse la emisión de las Autorizaciones de Captura por parte de la Autoridad de Aplicación de acuerdo a lo establecido en las Actas del visto.

Que a los fines de una adecuada administración se hace necesario establecer anualmente la cantidad correspondiente a las Autorizaciones de Captura de cada buque.

Que el suscripto es competente para el dictado de la presente en virtud de los artículos 9°, 27 y 28 de la Ley N° 24.922.

Por ello, EL CONSEJO FEDERAL PESQUERO RESUELVE:

ARTÍCULO 1°.- Implementar las Autorizaciones de Captura para la especie vieira patagónica (*Zygochlamys patagonica*) por el plazo de CINCO (5) años contados a partir del 1° de enero de 2009.

ARTÍCULO 2°.- Asignar Autorizaciones de Captura sobre el OCHENTA Y CINCO POR CIENTO (85 %) de la Captura Máxima Permisible a los buques que registran historia de captura de la especie mayor al DOS CON CINCO POR CIENTO (2,5 %), calculado sobre el total de las capturas de la especie en el período comprendido entre los años 2000 y 2007 -ambos inclusive-.

ARTICULO 3°.- Establecer la ponderación de los criterios para la asignación de las Autorizaciones de Captura previstas en el artículo 2°, de la siguiente manera:

a) historia de captura en el NOVENTA Y CINCO POR CIENTO (95%),

b) sanciones en el CINCO POR CIENTO (5%).

ARTICULO 4º - Fijar el porcentaje máximo de concentración por empresa o grupo empresario en el CUARENTA POR CIENTO (40 %) de la Captura Máxima Permisible.

ARTÍCULO 5º.- Fijar la reserva de administración que se conformará con el QUINCE POR CIENTO (15 %) de la Captura Máxima Permisible, al que se le adicionarán los excedentes del porcentaje máximo de concentración y de la detracción resultante de la aplicación del ítem sanciones.

ARTÍCULO 6º.- Las asignaciones de Autorizaciones de Captura del artículo 2º se detallan en el ANEXO que forma parte de la presente resolución.

ARTÍCULO 7º.- La Autoridad de Aplicación emitirá las constancias de las Autorizaciones de Captura asignadas en el artículo 2º de la presente Resolución, y las inscribirá en el Registro de la Pesca.

ARTÍCULO 8º.- La Autoridad de Aplicación, a través de la DIRECCION NACIONAL DE COORDINACIÓN PESQUERA, calculará, sobre la base de la Captura Máxima Permisible de cada Unidad de Manejo, la cantidad de cada Autorización de Captura.

ARTICULO 9º.- La presente resolución entrará en vigencia a partir de su publicación en el Boletín Oficial.

ARTÍCULO 10.- Publíquese, dese a la Dirección Nacional del Registro Oficial y archívese.

RESOLUCION CFP N°

ANEXO

1.- **Condiciones:** Poseer más del 2,5% de capturas de la especie en el período 2000-2007.

2.- **Ponderación de ítems:**

Historia de capturas	95%
Sanciones	5%

3.

Límite participación por empresa o grupo empresario:	40%
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4.

Reserva de administración:	15%
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5. **Asignación de Autorizaciones de Captura:** (sobre el 85% de la CMP)

Buque	Mat.	Empresa	Autorización de Captura
ATLANTIC SURF I	6530	GLACIAR PESQUERA S.A.	23,26%
ATLANTIC SURF III	02030	GLACIAR PESQUERA S.A.	15,78%
MISTER BIG	6555	WANCHESE ARGENTINA S.A.	20,97%
ERIN BRUCE	6536	WANCHESE ARGENTINA S.A.	18,08%

6. Detalle de las asignaciones por empresa

Empresa	Cantidad Inicial	Cantidad Final
WANCHESE ARGENTINA S.A.	39,98%	39,04%
GLACIAR PESQUERA S.A.	45,02%	39,05%